IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPELLANTS:	Hodgson, et al.	EXAMINER:	Audrey Y. Chang
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TITLE:	ARCHITECTURE FOR LARGE OPTICAL FIBRE ARRAY USING STANDARD 1×2 COUPLERS		

CERTIFICATE OF MAILING

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Robert J. Brill
Robert J. Brill
Attorney for Appellants
Reg. No. 36,760

Date of Signature: January 16, 2004

Mail Stop Appeal Brief-Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF

Dear Sir:

This Appeal Brief is submitted (in triplicate) in response to the final Office Action mailed November 5, 2003 in connection with the above-designated application. A response to the final Office Action is due February 5, 2004. Therefore, this Appeal Brief is timely filed.

REAL PARTY IN INTEREST

The real party in interest is the assignee of the above-identified application, Northrop Grumman Corporation.

RELATED APPEALS AND INTERFERENCES

Appellants, appellants' legal representative, and the assignee of this application do not know of any other appeals or interferences which will directly affect, be directly affected by, or have a bearing on the Board's decision in this appeal.

STATUS OF CLAIMS

Claims 1 and 3-30 are pending and finally rejected, and claim 2 is cancelled. Claims 1 and 3-30 are on appeal.

STATUS OF AMENDMENTS

In response to the final Office Action mailed November 5, 2003, the Amendment Filed with Appeal is filed concurrently with this Appeal Brief.

SUMMARY OF THE INVENTION

Appellant's invention, as defined by independent claim 1, is directed to an $m \times n$ sensor array.

In this regard, page 2, lines 28, to page 3, line 2, page 3, lines 11-14, page 4, line 27, to page 5, line 10, page 8, lines 3-28, and FIGS. 2A-2H and 4A-4H of the application, for example, disclose that the $m \times n$ sensor array comprises m distribution fiber lines (DF1-DF6), n return fiber lines (RF1-RF16), and z sensor groups (301-316). In one example, FIGS. 2A-2H and 4A-4H disclose a 6×16 sensor array with 6 distribution fiber lines (DF1-DF6) and 16 return fiber

lines (RF1-RF16). The 6 × 16 sensor array comprises z sensor groups (301-316). Each of the 16 sensor groups (301-316) comprises y sensors, for example, 6 (FIGS. 2A-2H) or 12 (FIGS. 4A-4H) sensors of the sensors (S1-S96).

Page 4, line 27, to page 5, line 10, page 5, line 27, to page 6, line 29, page 8, lines 3-17, and FIGS. 2A-2H and 4A-4H, for example, disclose each of the sensor groups (301-316) comprises sensors (S1-S96), input couplers (320), and output couplers (330). Said input couplers (320) and said output couplers (330) being connected to respective ones of said sensors (S1-S96). Each of said input couplers (320) within any of said z sensor groups (301-316) is connected to a corresponding one of said m distribution fiber lines (DF1-DF6). Each of said output couplers (330) within any of said z sensor groups (301-316) is connected to a corresponding one of said n return fiber lines (RF1-RF16).

Page 5, line 27, to page 6, line 9, page 6, lines 24-29, and FIGS. 1, 2A-2H, 3, 4A-4H, and 5, for example, disclose the coupling ratios of said input couplers (320) and said output couplers (330) in said z sensor groups (301-316) are chosen to reduce differences in returned optical signal power levels. Said output couplers (330) comprise a first output coupler (e.g., the output coupler in group 301 with a 20% coupling ratio) and a second output coupler (e.g., the output coupler in group 301 with a 47% coupling ratio). A first number (e.g., one) of said output couplers (330) are located between said first output coupler and a signal destination (D1) on one (RF1) of said n return fiber lines (RF1-RF16). The first number is greater than or equal to zero. The coupling ratio of said first output coupler is based on the first number. A second number (e.g., four) of said output couplers (330) are located between said second output coupler and the signal destination (D1) on the one (RF1) of said n return fiber lines (RF1-RF16). The coupling ratio of said second output coupler is based on the second number. The second number is greater

than the first number. The coupling ratio of said second output coupler is larger than the coupling ratio of said first output coupler.

Claim 11 depends from claim 1. In this regard, page 6, lines 16-29 and FIGS 2A-2H and 4A-4H, for example, disclose the coupling ratios of said input couplers (320) in said sensor groups (301-316) include coupling ratios of 3.5%, 7%, 11%, 15%, 20%, 30% and 47%.

Claim 12 depends from claim 1. In this regard, page 5, line 27, to page 6, line 9 and FIGS 2A-2H and 4A-4H, for example, disclose the coupling ratios of said output couplers (330) connected to one of said return fiber lines (RF1-RF16) include coupling ratios of 15%, 20%, 25%, 30% and 47%.

Appellant's invention, as defined by independent claim 4, is directed to a sensor array.

In this regard, page 2, lines 28, to page 3, line 2, page 3, lines 11-14, page 4, line 27, to page 5, line 10, page 8, lines 3-28, and FIGS. 2A-2H and 4A-4H of the application, for example, disclose that the sensor array comprises distribution fiber lines (DF1-DF6), return fiber lines (RF1-RF16), and sensor groups (301-316).

Page 4, line 27, to page 5, line 10, page 5, line 27, to page 6, line 29, page 8, lines 3-17, and FIGS. 2A-2H and 4A-4H, for example, disclose each of the sensor groups (301-316) comprises sensors (S1-S96), input couplers (320), and output couplers (330). Said input couplers (320) and said output couplers (330) being connected to respective ones of said sensors (S1-S96). Each of said input couplers (320) within any of said sensor groups (301-316) is connected to a corresponding one of said distribution fiber lines (DF1-DF6). Each of said output couplers (330) within any of said sensor groups (301-316) is connected to a corresponding one of said return fiber lines (RF1-RF16).

Page 5, line 27, to page 6, line 9, page 6, lines 24-29, and FIGS. 2A-2H, 3, 4A-4H, and 5, for example, disclose coupling ratios of said input couplers (320) and said output couplers (330) are chosen to reduce differences in returned optical signal power levels. Said input couplers (320) in a first sensor group (e.g., sensor group 301) having a first input coupling ratio (e.g., 3.5%) and said input couplers (320) in a second sensor group (e.g., sensor group 306) having a second input coupling ratio (e.g., 7%) different from said first input coupling ratio.

Page 4, line 2, to page 5, line 10, and FIGS, 1, 2A-2H, and 4A-4H, for example, disclose one or more signal sources (L1-L6), that comprise a first signal source (e.g., signal source L1), are coupled with respective ones of said distribution fiber lines (DF1-DF6), that comprise a first distribution fiber line (e.g., distribution fiber line DF1).

Page 4, line 27, to page 6, line 29, and FIGS. 2A-2H and 4A-4H, for example, disclose said input couplers (320) comprise a first input coupler (e.g., an input coupler in group 301 with a 3.5% coupling ratio on the distribution fiber line DF1) and a second input coupler (e.g., the input coupler in group 306 with a 7% coupling ratio on the distribution fiber line DF1). A first number (e.g., zero) of said input couplers are located on the first distribution fiber line (DF1) between the first signal source (L1) and said first input coupler. The first number is greater than or equal to zero. The coupling ratio of said first input coupler is based on the first number. A second number (e.g., five) of said input couplers are located on the first distribution fiber line (DF1) between the first signal source (L1) and said second input coupler. The coupling ratio of said second input coupler is based on the second number. The second number is greater than the first number. The coupling ratio of said second input coupler is larger than the coupling ratio of said first input coupler.

Page 4, line 27, to page 6, line 29, and FIGS. 2A-2H and 4A-4H, for example, disclose each output coupler (330) is connected to a respective return fiber line from a sensor group having a coupling ratio that differs from the coupling ratio of the other output couplers (330) connected to the respective return fiber line. Said output couplers (330) comprise a first output coupler (e.g., the output coupler in group 301 with a 20% coupling ratio) and a second output coupler (e.g., the output coupler in group 301 with a 47% coupling ratio). A first number (e.g., one) of said output couplers (330) are located between said first output coupler and a signal destination (D1) on one (RF1) of said return fiber lines (RF1-RF16). The first number is greater than or equal to zero. The coupling ratio of said first output coupler is based on the first number. A second number (e.g., four) of said output couplers (330) are located between said second output coupler and the signal destination (D1) on the one (RF1) of said return fiber lines (RF1-RF16). The coupling ratio of said second output coupler is based on the second number. The second number is greater than the first number. The coupling ratio of said second output coupler is larger than the coupling ratio of said first output coupler. Said input coupling ratios and said output coupling ratios selected in accordance with respective locations of said input couplers (320) on said distribution fiber lines (DF1-DF6) and respective locations of said output couplers (330) on said return fiber lines (RF1-RF16).

Appellant's invention, as defined by independent claim 21, is directed to an $m \times n$ sensor array.

In this regard, page 2, lines 28, to page 3, line 2, page 3, lines 11-14, page 4, line 27, to page 5, line 10, page 8, lines 3-28, and FIGS. 2A-2H and 4A-4H of the application, for example, disclose that the $m \times n$ sensor array comprises m distribution fiber lines (DF1-DF6), n return fiber lines (RF1-RF16), and z sensor groups (301-316). In one example, m is 6 and n is 16.

Page 4, line 27, to page 5, line 10, page 5, line 27, to page 6, line 29, page 8, lines 3-17, and FIGS. 2A-2H and 4A-4H, for example, disclose each of the z sensor groups (301-316) comprise y sensors (S1-S96), input couplers (320), and output couplers (330). Said input couplers (320) and said output couplers (330) being connected to respective ones of said sensors (S1-S96). Each of said input couplers (320) within any of said z sensor groups (301-316) is connected to a corresponding one of said m distribution fiber lines (DF1-DF6). Each of said output couplers (330) within any of said z sensor groups (301-316) is connected to a corresponding one of said n return fiber lines (RF1-RF16).

Page 5, line 27, to page 6, line 9, page 6, lines 24-29, and FIGS. 2A-2H, 3, 4A-4H, and 5, for example, disclose coupling ratios of said input couplers (320) and said output couplers (330) in said z sensor groups (301-316) are chosen to reduce differences in returned optical signal power levels. Said input couplers (320) comprise a first input coupler (e.g., an input coupler in group 301 with a 3.5% coupling ratio on the distribution fiber line DF1) and a second input coupler (e.g., the input coupler in group 306 with a 7% coupling ratio on the distribution fiber line DF1). A first number (e.g., zero) of said input couplers (320) are located between a signal source and said first input coupler on one (DF1) of said m distribution lines (DF1-DF6). The first number is greater than or equal to zero. A second number (e.g., five) of said input couplers are located between the signal source and said second input coupler on the one (DF1) of said m distribution lines (DF1-DF6). The second number is greater than the first number. The input coupling ratio of said second input coupler is higher than the input coupling ratio of said first input coupler.

Appellant's invention, as defined by independent claim 22, is directed to an m × n sensor array.

In this regard, page 2, lines 28, to page 3, line 2, page 3, lines 11-14, page 4, line 27, to page 5, line 10, page 8, lines 3-28, and FIGS. 2A-2H and 4A-4H of the application, for example, disclose that the m × n sensor array comprises m distribution fiber lines (DF1-DF6), n return fiber lines (RF1-RF16), and z sensor groups (301-316). In one example, m is 6 and n is 16.

Page 4, line 27, to page 5, line 10, page 5, line 27, to page 6, line 29, page 8, lines 3-17, and FIGS. 2A-2H and 4A-4H, for example, disclose each of said z sensor groups (301-316) comprise y sensors (S1-S96), input couplers (320), and output couplers (330). Said input couplers (320) and said output couplers (330) being connected to respective ones of said sensors (S1-S96). Each of said input couplers (320) within any one of said z sensor groups (301-316) being connected to a different one of said m distribution fiber lines (DF1-DF6).

Page 8, lines 3-28, and FIGS. 4A-4H, for example, disclose the n return fiber lines (RF1-RF16) comprise one or more sets (e.g., return fiber lines RF1 and RF2 of FIGS. 4A-4H make up a set of return fiber lines) of return fiber lines (RF1-RF16). A first one of each of the one or more sets of return fiber lines is connected to a first subset of said output couplers (330) within a respective one of said z sensor groups (301-316). A second one of each of the one or more sets of return fiber lines is connected to a second subset of said output couplers (330) within the respective one of said z sensor groups (301-316).

Page 5, line 27, to page 6, line 9, page 6, lines 24-29, and FIGS. 2A-2H, 3, 4A-4H, and 5, for example, disclose coupling ratios of said input couplers (320) and said output couplers (330) in said z sensor groups (301-316) are chosen to reduce differences in returned optical signal power levels. Said output couplers (330) comprise a first output coupler (e.g., the output coupler in group 401 with a 20% coupling ratio) and a second output coupler (e.g., the output coupler in group 401 with a 47% coupling ratio). A first number (e.g., one) of said output couplers (330) are located between said first output coupler and a signal destination (D1) on one (RF1) of said n return fiber lines (RF1-RF16). The first number is greater than or equal to zero. The coupling ratio of said first output coupler is based on the first number. A second number (e.g., five) of said output couplers (330) are located between said second output coupler and the signal destination (D1) on the one (RF1) of said n return fiber lines (RF1-RF16). The coupling ratio of said second output coupler is based on the second number. The second number is greater than the first number. The coupling ratio of said second output coupler is larger than the coupling ratio of said first output coupler.

ISSUES

The first issue presented for review on appeal is whether the Examiner erred in rejecting claims 1 and 3-30 under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement.

The second issue presented for review on appeal is whether the Examiner erred in rejecting claims 1 and 3-30 under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which appellants regards as the invention.

The third issue presented for review on appeal is whether the Examiner erred in rejecting claims 1 and 3-10, and 13-30 under 35 U.S.C. §103 as being unpatentable over Giallorenzi (U.S. Patent No. 4,648,083; "Giallorenzi").

GROUPING OF CLAIMS

Appellants submit that all the pending claims will stand or fall together.

ARGUMENTS

I. CLAIMS 1 AND 3-30 COMPLY WITH 35 U.S.C. §112, FIRST PARAGRAPH

The specification and drawings reasonably convey to one skilled in the relevant art that appellants had possession of the invention of claims 1 and 3-30 at the priority filing date.

The final Office Action expressly cites the prior Office Action mailed June 9, 2003 that states at paragraph 2, page 2:

> The specification fails to give a clear and full description for determining the coupling ratios of the input couplers and output couplers based on the "first number of input (or output) coupler", the "second number of input (or output) coupler", the "first input coupler", the "second input coupler", the "first output coupler" and the "second output coupler" as recited in claims 1, 4, 21 and 22. The applicant is respectfully noted that specification only gives support for **assigning** certain coupling rati[o] values for the input couplers that connect different sensors, (as shown in page 6, lines 16-24), and for **selecting** certain coupling ratio values for the output couplers (as shown in page 5 line 27 to page 6 line 9). No **scheme** of determination based on numbers of couplers, the first and second coupler as set forth in the claims ever been given in the specification. (*Emphasis in original.*)

In this regard, MPEP § 2163.02 states:

> The courts have described the essential question to be addressed in a description requirement issue in a variety of ways. An objective standard for determining compliance with the written description requirement is, "does the description clearly allow persons of ordinary skill in the art to recognize that he or she

> invented what is claimed." *In re Gosteli*, 872 F.2d 1008, 1012, 10 USPQ2d 1614, 1618 (Fed. Cir. 1989). Under *Vas-Cath, Inc. v. Mahurkar*, 935 F.2d 1555, 1563-64, 19 USPQ2d 1111, 1117 (Fed. Cir. 1991), to satisfy the written description requirement, an applicant must convey with reasonable clarity to those skilled in the art that, as of the filing date sought, he or she was in possession of the invention, and that the invention, in that context, is whatever is now claimed. The test for sufficiency of support in a parent application is whether the disclosure of the application relied upon "reasonably conveys to the artisan that the inventor had possession at that time of the later claimed subject matter." *Ralston Purina Co. v. Far-Mar-Co., Inc.*, 772 F.2d 1570, 1575, 227 USPQ 177, 179 (Fed. Cir. 1985) (quoting *In re Kaslow*, 707 F.2d 1366, 1375, 217 USPQ 1089, 1096 (Fed. Cir. 1983)).

Turning to the limitations cited for claim 1, claim 1 recites, *inter alia*:

> wherein a first number of said output couplers are located between said first output coupler and a signal destination on one of said n return fiber lines, wherein the first number is greater than or equal to zero, wherein the coupling ratio of said first output coupler is based on the first number, wherein a second number of said output couplers are located between said second output coupler and the signal destination on the one of said n return fiber lines, wherein the coupling ratio of said second output coupler is based on the second number, wherein the second number is greater than the first number, wherein the coupling ratio of said second output coupler is larger than the coupling ratio of said first output coupler;

Exemplary support for these limitations of claim 1 (and analogous limitations in claims 4 and 22) is found in FIGS. 2-2H and 4-4H, as discussed herein, and in the specification at page 5, line 27, to page 6, line 9, as follows:

> The output couplers 330 have respective coupling ratios chosen to reduce differences in the respective returned optical signal power levels. The coupling ratios are preferably chosen suck that the signal levels of the optical signals returned from the sensor groups to their associated detectors d1-D16 are within a 7 dB range of each other.... In particular, the coupling ratios of the return couplers 330 are selected to be **progressively larger** from the sensor S1 to the sensor S6 (S6 has an effective coupling ratio of 100%) to compensate for the fact that the signals from the sensors S1-S6 pass through **different combinations of couplers**, causing each return signal to have a **different overall**

> **transmission** through the return fiber RF1. (Emphasis added for explanatory purposes).

FIGS. 2-2H and 4-4H disclose support for the cited limitations of claim 1 (and analogous limitations of claims 4 and 22). In one example (among a variety of examples disclosed in FIGS. 2-2H and 4-4H), the "first output coupler" is the output coupler of sensor S2. So, one output coupler ("a first number") is located between the output coupler of sensor S2 and the detector D1 ("signal destination") on return fiber line RF1. The first number ("one") is greater than or equal to zero. In one example, the "second output coupler" is the output coupler of sensor S4. So, three output couplers ("a second number") are located between the output coupler of sensor S4 and the detector D1 ("signal destination") on return fiber line RF1. The "second number" ("three") is greater than the "first number" ("one"). The coupling ratio ("30%") of the output coupler of sensor S4 is larger than the coupling ratio ("20%") of the output coupler of sensor S2. The coupling ratio ("20%") of the output coupler of sensor S2 is based on the first number ("one") and the coupling ratio ("30%") of the output coupler of sensor S4 is based on the second number ("three") as the first and second numbers determine a relative position of the output couplers on the return fiber line RF1. The relative position of the output couplers on the return fiber line RF1 determines relative coupling ratios for the first and second output couplers based on a progressively larger coupling ratio from the sensor S1 to the sensor S6 to achieve a 7 dB maximum range for the returned optical signal power levels.

Therefore, the specification and drawings reasonably convey to one skilled in the relevant art that the appellants had possession of the invention of claim 1, including the cited limitations of claim 1, (and the invention of claims 4 and 22, including the analogous limitations of claims 4 and 22) at the priority filing date.

Turning to the additional limitations cited for claim 4, claim 4 recites, *inter alia*:

> wherein a first number of said input couplers are located on the first distribution fiber line between the first signal source and said first input coupler, wherein the first number is greater than or equal to zero, wherein the coupling ratio of said first input coupler is based on the first number, wherein a second number of said input couplers are located between the first signal source and said second input coupler, wherein the coupling ratio of said second input coupler is based on the second number, wherein the second number is greater than the first number, wherein the coupling ratio of said second input coupler is larger than the coupling ratio of said first input coupler;

Exemplary support for these limitations of claim 4 (and analogous limitations in claim 21) is found in FIGS. 2-2H and 4-4H, as discussed herein, and in the specification at page 6, lines 16-23, as follows:

> In each sensor group, a certain fraction of the input optical signal in each distribution fiber line DF1-DF6 is directed (coupled) into the sensors of that group. However, to maintain roughly the same level of input optical power at each sensor, this fraction is higher for sensor groups further removed from the lasers L1-L6, since optical power must be shared among fewer subsequent sensor groups. Thus, the input coupling ratio is chosen to be 7% at sensors S31-S54, 11% at sensors S55-S66, 15% at sensors S67-S72, 20% at sensors S73-S78, 30% at sensors S79-S84, 47% at sensors S85-S90, and 100% at sensors S91-S96 at which point an input coupler is no longer needed.

FIGS. 2-2H and 4-4H disclose support for the cited limitations of claim 4 (and analogous limitations of claim 21). In one example (among a variety of examples disclosed in FIGS. 2-2H and 4-4H), the "first input coupler" is the input coupler of sensor S25. So, four input couplers ("a first number") are located between the input coupler of sensor S25 and the laser L1 ("signal source") on distribution fiber line DF1. The first number ("four") is greater than or equal to zero. In one example, the "second input coupler" is the input coupler of sensor S31. So, five input couplers ("a second number") are located between the input coupler of sensor S31 and the laser L1 ("signal source") on distribution fiber line DF1. The "second number" ("five") is greater than the "first number" ("four"). The coupling ratio ("7%") of the input coupler of

sensor S31 is larger than the coupling ratio ("3.5%") of the input coupler of sensor S25. The coupling ratio ("3.5%") of the input coupler of sensor S25 is based on the first number ("four") and the coupling ratio ("7%") of the input coupler of sensor S31 is based on the second number ("five") as the first and second numbers determine a relative position of the input couplers on the distribution fiber line DF1. The relative position of the input couplers on the distribution fiber line DF1 determines relative coupling ratios for the first and second input couplers to achieve a 7 dB maximum range for the returned optical signal power levels.

Therefore, the specification and drawings reasonably convey to one skilled in the relevant art that the appellants had possession of the invention of claim 4, including the cited limitations of claim 4, (and the invention of claim 21, including the analogous limitations of claim 21) at the priority filing date.

II. CLAIMS 1 AND 3-30 COMPLY WITH 35 U.S.C. §112, SECOND PARAGRAPH

Claims 1 and 3-30 particularly point out and distinctly claim the subject matter which the appellants regard as the invention.

1. Issue of "first input coupler" and "second input coupler" or "first output coupler" and "second output coupler."

In regard to the output couplers of claims 1, 4, and 22 and the input couplers of claims 4 and 21, the above-referenced Office Action mailed June 9, 2003 states at paragraph 4, page 3:

> [T]he phrases concerning the determination of the coupling ratios for the input coupler and output coupler are confusing and indefinite. It is not clear what are these "first input coupler" and "second input coupler" or "first output coupler" and "second output coupler". Also it is not clear how are these "first number of couplers" and "second number of couplers" determined or how do they relate to each other. It is not clear if these couplers are in the same sensor group or not. It is not clear if these couplers are on the same distribution line or on the same return line or not. The

> language is so vague and confusing it is not possible to determine the scopes of the claims.

MPEP § 2173.02 states:

> The examiner's focus during examination of claims for compliance with the requirement for definiteness of 35 U.S.C. 112, second paragraph is whether the claim meets the threshold requirements of clarity and precision, not whether more suitable language or modes of expression are available. When the examiner is satisfied that patentable subject matter is disclosed, and it is apparent to the examiner that the claims are directed to such patentable subject matter, he or she should allow claims which define the patentable subject matter with a <u>reasonable</u> degree of particularity and distinctness. Some latitude in the manner of expression and the aptness of terms should be permitted even though the claim language is not as precise as the examiner might desire. Examiners are encouraged to suggest claim language to applicants to improve the clarity or precision of the language used, but should not reject claims or insist on their own preferences if other modes of expression selected by applicants satisfy the statutory requirement.

MPEP § 2173.04 states:

> Breadth of a claim is not to be equated with indefiniteness. *In re Miller*, 441 F.2d 689, 169 USPQ 597 (CCPA 1971). If the scope of the subject matter embraced by the claims is clear, and if applicants have not otherwise indicated that they intend the invention to be of a scope different from that defined in the claims, then the claims comply with 35 U.S.C. 112, second paragraph.

With respect to the first output coupler, the second output coupler, and the first number of output couplers, claim 1 recites, *inter alia*:

> wherein said output couplers comprise a first output coupler and a second output coupler, wherein a first number of said output couplers are located between said first output coupler and a signal destination on **one of said n return fiber lines**, wherein the first number is greater than or equal to zero, wherein the coupling ratio of said first output coupler is based on the first number, wherein a second number of said output couplers are located between said second output coupler and the signal destination on **the one of said n return fiber lines**,... (Emphasis added for explanatory purposes).

With respect to the first input coupler, the second input coupler, and the second number of input couplers, claim 4 recites, *inter alia*:

> wherein said input couplers comprise a first input coupler and a second input coupler, wherein a first number of said input couplers are located **on the first distribution fiber line** between the first signal source and said first input coupler, wherein the first number is greater than or equal to zero, wherein the coupling ratio of said first input coupler is based on the first number, wherein a second number of said input couplers are located on **the first distribution fiber line** between the first signal source and said second input coupler,... (Emphasis added for explanatory purposes).

The first output coupler and the second output coupler are on the same return fiber line. A first number of output couplers are located between the first output coupler and the second output coupler on the return fiber line. The first input coupler and the second input coupler are on the same distribution fiber line. A first number of input couplers are located between the first input coupler and the second input coupler on the distribution fiber line.

The coupling ratio of the second output coupler is related to the coupling ratio of the first output coupler by a relation between the number of output couplers located between the respective second and first output couplers and the signal destination on the one of the n return fiber lines. For example, referring to FIG. 2A of the subject application, the coupling ratio of the output coupler for the sensor S5 is represented as 47%. Four output couplers are illustrated as being located between the output coupler for the sensor S5 and the signal destination on the return fiber line RF1. In addition, the coupling ratio of the output coupler for the sensor S2 is represented as 20%. One output coupler is represented as located between the output coupler for the sensor S2 and the signal destination on the return fiber line RF1.

So, the number (four) of output couplers located between the output coupler for the sensor S5 and the signal destination on the return fiber line RF1 is greater than the number (one)

of output couplers located between the output coupler for the sensor S2 and the signal destination on the return fiber line RF1. Furthermore, the coupling ratio (47%) of the output coupler for the sensor S5 is larger than the coupling ratio (20%) of the output coupler for the sensor S2. Appellants respectfully submit that the specification (e.g., page 5, line 11, to page 6, line 9; page 6, line 16, to page 7, line 12) and figures (e.g., FIGS. 2A-2H and 4A-4H) disclose the coupling ratios of the output couplers are related to the number of output couplers located between the particular output coupler and the signal destination on the return fiber line. The discussion presented above with respect to claim 1 and 4 also applies analogously to claims 21-22.

The discussion presented above overcoming the rejection of claims 1 and 4 also applies analogously to overcoming the rejection of claims 21 and 22.

2. *Issue of "a first number of said output couplers are located between said first output coupler and a signal destination on one of said n return fiber lines."*

In regard to the signal destination of claims 1, 4, and 22, the above-referenced Office Action mailed June 9, 2003 states at paragraph 4, page 3:

> The phrase "a first number of said output couplers are located between said first output coupler and a signal destination on one of said n return line" recited in claim 1 is confusing and indefinite since it is not clear how could the couplers be located between a coupler and a signal?

Claim 1 recites, *inter alia*:

> wherein a first number of said output couplers are located between said first output coupler and a signal **destination** on one of said n return fiber lines,... (Emphasis added for explanatory purposes).

Claims 1, 4, and 22 recite a number of couplers located between a coupler and a signal source or signal destination, not between a coupler and a signal as stated by the Examiner. The

signal source in one example is one of the lasers L1-L6. The signal destination in one example is one of the detectors D1-16 or the processing electronics 200.

The discussion presented above overcoming the rejection of claim 1 also applies analogously to overcoming the rejection of claims 4 and 22.

3. Issue of the input couplers and output couplers language allegedly failing to meet the threshold requirements of clarity and precision.

In regard to the input couplers and output couplers, the final Office Action states at paragraph 9, page 4:

> [T]he claims have recited the following terms "z sensor groups, each of said sensor groups comprising... input coupler[s] and output couplers," "said input couplers and said output couplers in said z sensor groups," "first output (or input) coupler," and "second output (or input) coupler." These terms recite a plurality of input and output couplers in all of the z sensor groups. The term "said output couplers" and the term "said input coupler" in the claims therefore become confusing and indefinite since it is not clear **which** output coupler or which input coupler is referred here. These confusing and indefinite phrases seriously contribute "antecedent basis" problems. In fact, since there are a plurality of output and input couplers in each of the z sensor groups, it is even not clear if the couplers are within the same sensor group or not.

As stated in the claims, within each sensor group there are input couplers and output couplers. Within the output couplers of each sensor group there is a first output coupler and a second output coupler. The first output coupler and second output coupler are within the same group. Within the input couplers of the sensor groups is a first input coupler and a second input coupler. The first input coupler are on a same distribution fiber line and are in different sensor groups.

4. Issue of the "signal destination."

In regard to the signal destination, the final Office Action states at paragraph 9, page 4:

> The phrase "a signal designation on one of said n return fiber lines" could be interpreted as (1) signal designated on the return fiber line, (2) a return fiber line with signal designated on it, since the specification fails to give a DEFINITION for such term. In applicant[s'] arguments, the applicant[s] [have] identified the "signal designation" with the "detector" however there is no support for such interpretation in the specification. The phrase therefore remained indefinite and unclear.

The claims recite "signal destination" not "signal designation." The optical signals that propagate along the return fiber lines end up at a "signal destination" (e.g., a detector).

III. <u>CLAIMS 1 AND 3-30 ARE PATENTABLY DISTINGUISHABLE FROM GIALLORENZI</u>

A prima facie case of obviousness has not been established for the invention recited in claims 1 and 3-30. To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim

limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on appellant's disclosure. *In re Vaeck,* 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); In re Jones, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). A "strict observance" of the factual predicates to an obviousness conclusion is required. *Graham v. John Deere Co.*, 383 U.S. 1, 18, 148 U.S.P.Q. (BNA) 459, 467 (1966). Without a motivation to combine references, a rejection based on a prima facie case of obviousness is improper. *In re Rouffet*, 149 F.3d 1350, 47 USPQ2d 1453 (Fed. Cir. 1998). The level of skill in the art cannot be relied upon to provide the suggestion to combine references. *Al-Site Corp. v. VSI Int'l Inc.*, 174 F.3d 1308, 50 USPQ2d 1161 (Fed. Cir. 1999). The reference teachings must appear to be sufficient for one of ordinary skill in the relevant art having the reference before him to make the proposed substitution, combination, or other modification. *In re Linter*, 458 F.2d 1013, 1016, 173 USPQ 560, 562 (CCPA 1972). Actual evidence of the teaching, suggestion, or motivation is required and must be clear and particular. *In re Dembiczak*, 175 F.3d 994, 999 (Fed. Cir. 1999).

Appellants respectfully submit that Giallorenzi does not teach or suggest one or more limitations of the invention recited in claims 1, 4, and 22. A careful reading of Giallorenzi fails to teach or suggest, for example, the coupling ratios of the input couplers and the output couplers in the z sensor groups chosen to reduce differences in the returned optical signal power levels, wherein the output couplers comprise the first output coupler and the second output coupler,

wherein the first number of the output couplers are located between the first output coupler and the signal destination on one of the n return fiber lines, wherein the first number is greater than or equal to zero, wherein the coupling ratio of the first output coupler is based on the first number, wherein the second number of the output couplers are located between the second output coupler and the signal destination on the one of the n return fiber lines, wherein the coupling ratio of the second output coupler is based on the second number, wherein the second number is greater than the first number, wherein the coupling ratio of the second output coupler is larger than the coupling ratio of the first output coupler.

In addition, appellants respectfully submit that Giallorenzi does not teach or suggest one or more limitations of the invention recited in claims 4 and 21. A careful reading of Giallorenzi fails to teach or suggest, for example, wherein coupling ratios of said input couplers and said output couplers are chosen to reduce differences in the returned optical signal power levels, said input couplers in a first sensor group having a first input coupling ratio and said input couplers in a second sensor group having a second input coupling ratio different from said first input coupling ratio, wherein said input couplers comprise a first input coupler and a second input coupler, wherein a first number of said input couplers are located on the first distribution fiber line between the first signal source and said first input coupler, wherein the first number is greater than or equal to zero, wherein the coupling ratio of said first input coupler is based on the first number, wherein a second number of said input couplers are located on the first distribution fiber line between the first signal source and said second input coupler, wherein the coupling ratio of said second input coupler is based on the second number, wherein the second number is greater than the first number, wherein the coupling ratio of said second input coupler is larger than the coupling ratio of said first input coupler

These points have even been conceded by the above-referenced Office Action mailed June 9, 2003 (paragraph 6, page 5):

> [T]his reference does not teach explicitly that the coupling ratios for the input couplers and output couplers are determined to reduce the difference in the retu[r]ned optical signal power levels,...

Notwithstanding this admitted deficiency of Giallorenzi, the above-referenced Office Action mailed June 9, 2003 states at paragraph 6, page 5:

> [V]arying the coupling ratio of an optical coupler to adjust the power levels of fiber lines connected by the optical coupler is standard knowledge in the art.

This justification for modifying Giallorenzi conspicuously fails to identify any express teaching, suggestion, or incentive in the art for making the modification. Appellants respectfully submit, upon review, that Giallorenzi fails to provide the express teaching, suggestion, or incentive.

A statement that modifications of the prior art to meet the claimed invention would have been "well within the ordinary skill of the art at the time the claimed invention was made" because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a prima facie case of obviousness without some objective reason to combine the teachings of the references. *Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993). The teachings of the references must be applied in the context of their significance to a technician at the time without knowledge of the solution. *Interconnect Planning Corp. v. Feil*, 774 F.2d 1132, 1143 (Fed. Cir. 1995).

> A critical step in analyzing the patentability of claims pursuant to section 103(a) is casting the mind back to the time of invention, to consider the thinking of one of ordinary skill in the art, guided only by the prior art references and the then-accepted wisdom in the field. *In re Kotzab*, 217 F.3d 1365, 1369 (Fed. Cir. 2000).

To reach a proper determination under 35 U.S.C. §103, the examiner must step backward in time and into the shoes worn by the hypothetical "person of ordinary skill in the art" when the invention was unknown and just before it was made. In view of all factual information, the examiner must then make a determination whether the claimed invention "as a whole" would have been obvious at that time to that person. Knowledge of appellants' disclosure must be put aside in reaching this determination, yet kept in mind in order to determine the "differences," conduct the search and evaluate the "subject matter as a whole" of the invention. The tendency to resort to "hindsight" based upon appellants' disclosure is often difficult to avoid due to the very nature of the examination process. However, impermissible hindsight must be avoided and the legal conclusion must be reached on the basis of the facts gleaned from the prior art.

Since, as noted above, the justification to modify Giallorenzi is hindsight reconstruction of the results of the present invention, the Office Action's reasoning is actually using the present invention itself as a basis to modify Giallorenzi. This violates the settled principle that a motivation to modify a reference cannot come from the invention itself. *Heidelberger Druckmaschinen A.G. v. Hantscho Commercial Products, Inc.*, 21 F.3d 1068, 1072 (Fed. Cir. 1994).

MPEP §2143.01 states:

> The mere fact that references <u>can</u> be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990; *emphasis in original*).

The initial burden is on the examiner to provide some suggestion of the desirability of doing what the inventor has done.

> To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the

> examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references. *Ex parte Clapp*, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985).

Since no express teaching or suggestion in the art has been identified for the modification of Giallorenzi, attention must be turned to the reasoning to determine whether the Office Action is convincing regarding whether appellants' claimed invention is obvious. Here, the justification given by the above-referenced Office Action mailed June 9, 2003 (paragraph 6, page 5) is nothing more than hindsight restatement of the results of the modification.

> Such modification would have been obvious to one skilled in the art to improve the power distribution and power return in the sensor array arrangement.

This justification is tantamount to stating that "it would be obvious to modify A to have B because it provides A plus B." This line of reasoning cannot be considered "convincing," since it is settled that it is impermissible to simply engage in hindsight reconstruction of the claimed invention, using the claimed invention as a template and selecting elements to fill the gaps.

Appellants submit, upon a close examination of the record, that the Examiner has failed to meet the burden of establishing a prima facie case of obviousness for the invention recited in claims 1 and 3-30. For all the above reasons, claims 1 and 3-30 are believed neither anticipated nor obvious over the art of record.

For all the foregoing reasons, appellants submit that claims 1 and 3-30 are patentable over the art of record. It is respectfully requested that the Board reverse the decision of the Examiner in all aspects.

Respectfully submitted,

Robert J. Brill

Robert J. Brill
Attorney for Appellants
Reg. No. 36,760

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PATTI & BRILL, LLC
Customer Number 32205

APPENDIX

1. An $m \times n$ sensor array, comprising:

m distribution fiber lines;

n return fiber lines; and

z sensor groups, each of said z sensor groups comprising:

y sensors; and

input couplers and output couplers, said input couplers and said output couplers being connected to respective ones of said sensors, wherein each of said input couplers within any of said z sensor groups is connected to a corresponding one of said m distribution fiber lines, wherein each of said output couplers within any of said z sensor groups is connected to a corresponding one of said n return fiber lines;

wherein coupling ratios of said input couplers and said output couplers in said z sensor groups are chosen to reduce differences in returned optical signal power levels;

wherein said output couplers comprise a first output coupler and a second output coupler, wherein a first number of said output couplers are located between said first output coupler and a signal destination on one of said n return fiber lines, wherein the first number is greater than or equal to zero, wherein the coupling ratio of said first output coupler is based on the first number, wherein a second number of said output couplers are located between said second output coupler and the signal destination on the one of said n return fiber lines, wherein the coupling ratio of said second output coupler is based on the second number, wherein the second number is greater than the first number, wherein the coupling ratio of said second output coupler is larger than the coupling ratio of said first output coupler;

wherein m is 6 and n is 16.

3. The sensor array of Claim 1, wherein each of said distribution fibers is coupled only to sensors that are non-adjacent.

4. A sensor array, comprising:

distribution fiber lines;

return fiber lines; and

sensor groups, each of said sensor groups comprising:

sensors; and

input couplers and output couplers, said input couplers and said output couplers being connected to respective ones of said sensors, wherein each of said input couplers within any of said sensor groups is connected to a corresponding one of said distribution fiber lines, wherein each of said output couplers within any of said sensor groups is connected to a corresponding one of said return fiber lines;

wherein coupling ratios of said input couplers and said output couplers are chosen to reduce differences in returned optical signal power levels, said input couplers in a first sensor group having a first input coupling ratio and said input couplers in a second sensor group having a second input coupling ratio different from said first input coupling ratio;

wherein one or more signal sources, that comprise a first signal source, are coupled with respective ones of said distribution fiber lines, that comprise a first distribution fiber line;

wherein said input couplers comprise a first input coupler and a second input coupler, wherein a first number of said input couplers are located on the first distribution fiber line between the first signal source and said first input coupler, wherein the first number is greater than or equal to zero, wherein the coupling ratio of said first input coupler is based on the first number, wherein a second number of said input couplers are located on the first distribution fiber line between the first signal source and said second input coupler, wherein the coupling ratio of said second input coupler is based on the second number, wherein the second number is greater than the first number, wherein the coupling ratio of said second input coupler is larger than the coupling ratio of said first input coupler;

wherein each output coupler is connected to a respective return fiber line from a sensor group having a coupling ratio that differs from the coupling ratio of the other output couplers connected to the respective return fiber line, wherein said output couplers comprise a first output coupler and a second output coupler, wherein a first number of said output couplers are located between said first output coupler and a signal destination on one of said return fiber lines, wherein the first number is greater than or equal to zero, wherein the coupling ratio of said first output coupler is based on the first number, wherein a second number of said output couplers are located between said second output coupler and the signal destination on the one of said return fiber lines, wherein the coupling ratio of said second output coupler is based on the second number, wherein the second number is greater than the first number, wherein the coupling ratio of said second output coupler is larger than the coupling ratio of said first output coupler, said input coupling ratios and said output coupling ratios selected in accordance with respective locations of said input couplers on said distribution fiber lines and respective locations of said output couplers on said return fiber lines.

5. The sensor array of Claim 4, wherein returned optical signals have respective powers within a 7 dB range.

6. The sensor array of Claim 4, wherein the number of said distribution fiber lines is 6, and the number of said returned fiber lines is 16.

7. The sensor array of Claim 4, wherein optical signals are multiplexed on said return fiber lines.

8. The sensor array of Claim 4, wherein said input couplers and said output couplers are 1×2 couplers.

9. The $m \times n$ sensor array as defined in Claim 1, wherein the coupling ratio of any one of said output couplers is based on a number of said output couplers located between the any one of said output couplers and a signal destination on one of the said n return fiber lines that corresponds to the any one of said output couplers.

10. The $m \times n$ sensor array as defined in Claim 1, wherein the coupling ratio of any one of said input couplers is based on a number of said input couplers located between the any one of said input couplers and a signal source on one of the said m distribution fiber lines that corresponds to the any one of said input couplers.

11. The $m \times n$ sensor array as defined in Claim 1, wherein the coupling ratios of said input couplers in said sensor groups include coupling ratios of 3.5%, 7%, 11%, 15%, 20%, 30% and 47%.

12. The $m \times n$ sensor array as defined in Claim 1, wherein the coupling ratios of said output couplers connected to one of said return fiber lines include coupling ratios of 15%, 20%, 25%, 30% and 47%.

13. The array of claim 1, wherein the coupling ratios of said input couplers and said output couplers in said z sensor groups serve to cause all the returned optical signal power levels to be within a preselected variance range.

14. The array of claim 1, wherein y is greater than or equal to m.

15. The array of claim 1, wherein a multiplicative product of m and n is equal to a multiplicative product of z and y.

16. The array of claim 1, wherein one or more distribution fiber lines of the m distribution fiber lines are each coupled with two or more corresponding non-adjacent instances of the sensors.

17. The array of claim 1, wherein z is 16 and y is 6.

18. The array of claim 1, wherein z is 8 and y is 12.

19. The array of claim 9, wherein the coupling ratio of the any one of said output couplers varies directly with the number of said output couplers located between the any one of said output couplers and the signal destination that corresponds to the any one of said output couplers.

20. The array of claim 4, wherein the coupling ratios of said input couplers and the coupling ratios of said output couplers in said sensor array serve to cause all the returned optical signal power levels to be within a pre-selected variance range.

21. An $m \times n$ sensor array, comprising:

m distribution fiber lines;

n return fiber lines; and

z sensor groups, each of said z sensor groups comprising:

y sensors; and

input couplers and output couplers, said input couplers and said output couplers being connected to respective ones of said sensors, wherein each of said input couplers within any of said z sensor groups is connected to a corresponding one of said m distribution fiber lines, wherein each of said output couplers within any of said z sensor groups is connected to a corresponding one of said n return fiber lines;

wherein coupling ratios of said input couplers and said output couplers in said z sensor groups are chosen to reduce differences in returned optical signal power levels, wherein said input couplers comprise a first input coupler and a second input coupler, wherein a first number of said input couplers are located between a signal source and said first input coupler on one of said m distribution fiber lines, wherein the first number is greater than or equal to zero, wherein a second number of said input couplers are located between the signal source and said second input coupler on the one of said m distribution lines, wherein the second number is greater than the first number, wherein the input coupling ratio of said second input coupler is higher than the input coupling ratio of said first input coupler;

wherein m is 6 and n is 16.

22. An $m \times n$ sensor array, comprising:

m distribution fiber lines;

n return fiber lines; and

z sensor groups, each of said z sensor groups comprising:

y sensors; and

input couplers and output couplers, said input couplers and said output couplers being connected to respective ones of said sensors, each of said input couplers within any one of said z sensor groups being connected to a different one of said m distribution fiber lines;

wherein the n return fiber lines comprise one or more sets of return fiber lines, wherein a first one of each of the one or more sets of return fiber lines is connected to a first subset of said output couplers within a respective one of said z sensor groups, wherein a second one of each of the one or more sets of return fiber lines is connected to a second subset of said output couplers within the respective one of said z sensor groups;

wherein coupling ratios of said input couplers and said output couplers in said z sensor groups are chosen to reduce differences in returned optical signal power levels;

wherein said output couplers comprise a first output coupler and a second output coupler, wherein a first number of said output couplers are located between said first output coupler and a signal destination on one of said n return fiber lines, wherein the first number is greater than or equal to zero, wherein the coupling ratio of said first output coupler is based on the first number, wherein a second number of said output couplers are located between said second output coupler and the signal destination on the one of said n return fiber lines, wherein the coupling ratio of said second output coupler is based on the second number, wherein the second number is greater than the first number, wherein the coupling ratio of said second output coupler is larger than the coupling ratio of said first output coupler;

wherein m is 6 and n is 16.

23. The array of claim 22, wherein the one or more sets of return fiber lines comprise one or more pairs of return fiber lines, wherein a first return fiber line of each of the one or more pairs of return fiber lines is connected to the first subset of said output couplers within the respective one of said z sensor groups, wherein a second return fiber line of each of the one or more pairs of return fiber lines is connected to the second subset of said output couplers within the respective one of said z sensor groups.

24. The array of claim 22, wherein one or more return fiber lines of said n return fiber lines are each coupled with two or more corresponding non-adjacent instances of the y sensors.

25. The array of claim 1, wherein each of said input couplers within any one of said z sensor groups is connected to a respective one of said m distribution fiber lines.

26. The array of claim 1, wherein each of said return fiber lines is connected to all output couplers within a respective one of said z sensor groups.

27. The array of claim 21, wherein z is 16 and y is 6.

28. The array of claim 21, wherein z is 8 and y is 12.

29. The array of claim 22, wherein z is 16 and y is 6.

30. The array of claim 22, wherein z is 8 and y is 12.